

TP 5291 E

DISABLED GROUP TRANSPORTATION VEHICLE

**AN EVALUATION OF USER DEMAND,
VEHICLE REQUIREMENTS AND FUNDING SOURCES,
FOR A VEHICLE FOR TRANSPORTATION OF
LARGE GROUPS OF DISABLED PERSONS**

**PREPARED FOR
TRANSPORTATION DEVELOPMENT CENTRE**

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**BY
DeLCan**

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TP 5291E

**DISABLED GROUP TRANSPORTATION
VEHICLE:
An Evaluation of User Demand,
Vehicle Requirements and Funding Sources**

by
Peter Kaulback

for
**Transportation Development Centre
Transport Canada**



April, 1984

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"The contents of this report reflect the views of the contractor and not necessarily the official views or policies of the Transportation Development Centre, Transport Canada."

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17. Abstract The project objective was the determination of potential demand for a vehicle for social/recreational trips by groups of disabled persons. Present demand, and the vehicles used, and future requirements are examined for a sample of institutions. Data were collected principally by means of an extensive questionnaire. There is an expressed demand for a more suitable vehicle than the modified vans currently used by most institutions. However the lack of available funds is common place. Furthermore, there is no consensus on the optimum size of vehicle. It is thus inappropriate to prepare a concept design of a specific vehicle but rather currently available vehicle types should be examined and assessed in terms of suitability for conversion to meet the requirements of a disabled group transportation vehicle. The project evaluated the suitability of small transit type buses, specially built body-on-chassis vehicles and modified school buses. It is recommended that the most suitable vehicle type is the school bus due to the range of sizes available, its proven reliability, availability of parts and components and, above all, reasonable cost.			
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17. Résumé Le projet avait pour but de déterminer la demande potentielle concernant un véhicule de transport de groupe et de loisir à l'intention des handicapés. La demande actuelle, les types de véhicules utilisés et les besoins futurs ont été recensés auprès d'un certain nombre d'établissements. Les données ont été recueillies principalement au moyen d'un questionnaire très structuré. Un véhicule mieux adapté que les fourgonnettes aménagées, et utilisées actuellement par la plupart des établissements, serait le bienvenu. Il existe toutefois un manque généralisé de crédits. En outre, on ne s'entend pas sur la taille idéale d'un tel véhicule. Il est donc déconseillé pour l'instant d'envisager la conception d'un véhicule bien déterminé et il serait préférable d'étudier et d'évaluer les possibilités de transformation de ceux déjà existants afin de répondre aux besoins du transport de groupe de personnes handicapées. Les auteurs du projet ont étudié les possibilités offertes par les petits autobus de transport, les véhicules comportant une carrosserie spécialement aménagée et les autobus scolaires transformés. Ils recommandent l'autobus scolaire en raison des différentes tailles disponibles, de sa fiabilité éprouvée, de la facilité à se procurer les pièces de rechange et, surtout, de son coût raisonnable.			
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1.0 INTRODUCTION

The Disabled Group Transportation Vehicle project was initiated by a request to Transportation Development Centre (TDC) seeking funds for the manufacture of a prototype bus that had been designed by Lennox Van Inc. of Montreal and was to be used by Comite Provincial Des Malades, in Montreal.

The direct provision of funds, as requested, is not within the mandate of TDC, however the request suggested to TDC that research into the demand for this type of vehicle, its technological specifications, possible funding and manufacturing possibilities would be a valuable addition to knowledge in this field. DeLCan have previously undertaken a project of a similar nature respecting vehicles for urban application, for TDC and the Canadian Urban Transit Association; Transit Vehicle For the Disabled

Phase I	Definition of Requirements	TP 3523
Phase II	Market Assessment	TP 3847 E
Phase III	Specification Guidelines	TP 4195 E
Summary Report		TP 4393 E

Following the evaluation of proposals, DeLCan, in association with Guillon, Smith, Marquart et Associes Ltee., TES Limited, and R. Moran, was selected to undertake the Disabled Group Transportation Vehicle project.

1.1 Methodology

The project objective, as identified in the Request for Proposal, is "To determine the extent of national user demand for a vehicle whose technological features meet the transportation requirements of large groups of disabled, especially those who are institutionalized, and to establish performance requirements and possible sources of funding for such a vehicle."

The work components to achieve the above objective are as follows:

1. Establish demand by determining
 - a) present travel and recreational outing patterns of potential user groups, and
 - b) their present (and if possible, future) unmet transportation needs;
2. Establish types, availability and suitability of vehicles currently in use;
3. Define the perceived performance requirements of the vehicle that is technologically suited for the intended use;
4. Examine the manufacturing capabilities and estimate costs;
5. Determine potential sources of funding for capital and maintenance costs.

The principal means of data collection was a questionnaire to potential user groups. Contacts with vehicle manufacturers were used to collect additional data on vehicles available, and to determine additional manufacturing capabilities, and associated costs.

From analysis of the questionnaires returned by potential user groups, data on travel patterns, unmet transportation needs and currently used vehicles can be determined. It was principally data on these topics that were included in the Interim Report, following the acceptance of which, further data on vehicle suitability, availability and funding were collected.

The most likely groups who might require a disabled group transportation vehicle are institutions such as rehabilitation hospitals, services for the handicapped, handicapped sports associations and so forth. The potential user groups were selected from two principal sources: (a) Canadian Rehabilitation Council for the Disabled, Information Directory of Urban Transportation Services for Physically Disabled Persons in Canada (1981) and (b) Directory of Rehabilitation and Related Agencies, Health and Welfare Canada (1981).

A number of newsletters were advised of the conduct of this study and some additional persons interested in receiving the questionnaire came forward as a result of this medium.

1.2 The Questionnaire

An initial questionnaire to collect the required data from user groups was prepared by DeLCan. This was reviewed by the TDC Project Officer who suggested a number of modifications. Following a series of changes to the questionnaire by both parties a final version was completed in early May, 1983. The questionnaire is both reasonably long and, in some parts, somewhat complex, despite the fact that every effort was made to keep it as short and as simple as possible, while still soliciting the requisite information. Because of the specific nature of the organization addressed, and the official capacity of the person receiving the questionnaire were often not known beforehand, global questions had to be avoided. In fact, there were so many ramifications to relevant issues that questionnaire items dealing with them had to attempt to cover all possibilities in order that the critical aspect emerge in each case. The questionnaire was therefore unavoidably long. The optimum means by which to conduct a survey of this nature is by personal interview; such a method allows the interviewer to find the correct respondent after arrival at the site, and to probe for the necessary information without concern regarding misinterpretations and the need for qualifying information. In this project the available budget did not permit the use of such a procedure. A copy of the questionnaire is included in Appendix A.

A total of some 190 questionnaires were sent out, 185 of which were mailed on May 3, 1983. Due to an unfortunate oversight the twenty-four questionnaires to Quebec recipients were originally sent in English. When this error was brought to our attention the questionnaire was rapidly translated and French versions were distributed on June 8, 1983.

1.3 Questionnaire Response

Responses to the questionnaire were slow in coming in. Some six weeks after the mailing of the questionnaires only thirty-six responses had been received. On June 21, 1983 a follow-up letter was sent to all those agencies to whom a questionnaire had been sent and from whom no response had been received (see Appendix B). This letter requested that if the questionnaire was not pertinent then an indication to that effect would be appreciated.

By September 21, 1983 a total of 107 'responses' had been received. These 'responses' consist of 44 questionnaires either partially or fully completed, and 61 indications that the topic of the research was not pertinent. Two questionnaires were returned by Canada Post as undeliverable.

It is worth noting that following the mailing of the follow-up letter there were indications from nine recipients that they had not previously received the questionnaire. The question therefore remains as to how many of the selected user groups did not receive the questionnaire and did not receive the letter, and how many received only the letter but were not sufficiently interested to request a questionnaire. Of those that did not complete the questionnaire but indicated that it was not pertinent, many did not provide for long distance social/recreational outings and their transportation requirement were met either by use of their own small urban vehicles or by contract services. It is apparent that the provision of social/recreational travel is not commonplace amongst rehabilitation centres as many indicated that they had no requirement for a specialized vehicle.

The response rate to the questionnaires, by province, is indicated in the following table. Note that response, in this context, refers both to returning a completed questionnaire or indicating that the questionnaire was not appropriate to the organization's operation.

Table 1
Response Rate to Questionnaires
(to September 15)

Province	No. Sent	Responses	Response Rate (%)
Territories	2	2	100
British Columbia	20	14	70
Alberta	20	11	55
Saskatchewan	13	10	77
Manitoba	19	8	42
Ontario	70	44	63
Quebec	24	6	25
New Brunswick	5	4	80
Prince Edward Island	3	2	66
Nova Scotia	7	4	57
Newfoundland	7	2	29
TOTAL	190	107*	56

* Note: of these 107 responses, 44 were returned questionnaires, either partially or fully completed; 61 indicated not pertinent and 2 were returned by Canada Post.

2.0 DATA FROM QUESTIONNAIRE

2.1 Preliminary Summary of Selected Questions from User Group Questionnaire

The following pages provide data extracted from the questionnaires on specific subject areas.

a) Type of Organization:

Hospital or Rehabilitation Centre	18
Group Home (e.g., Nursing Home)	3
Medical Society or Group	-
Service Club	-
Charitable Organization	9
Travel Agency	1
Sports Team or Organization	1
Other	<u>10</u>
	43

b) Use of Vehicles:

- o Does your organization use one or more vehicles to provide group recreational/social trips of the kind described in the introduction to this questionnaire?

Yes	27
No	<u>11</u>
	38

No. of vehicles used:

No. of vehicles:	1	2	3	4	5	6-10	11-15	16+
Respondents:	8	6	5	3	3	-	2	-

Note: of the 27 respondents, 70% utilize three or less vehicles.

- o How often are trips made?

<u>Frequency</u>	<u>Respondents</u>
Often	1
Daily (or more frequently)	6
1 per week	2
2-5 per week	8
20 per week*	1
4-6 per month	1
2 per month	2
2-6 per year	<u>6</u>
	27

Note: This figure applies to a group of five facilities sharing three buses.

- o Average number of persons per trip.

Average no. of persons	5	5-10	11-15	16-21	21+
Respondents	4	15	5	1	2

- o On the average is the capacity of the vehicle(s) you use sufficient to accommodate the demands on it for recreational/social trips?

Yes	<u>19</u>
No	<u>9</u>

- o Persons are not accommodated on trips because . . .

o beyond radius of pick up region	Yes	<u>9</u>	No	<u>14</u>
o too disabled to be accommodated	Yes	<u>14</u>	No	<u>13</u>
o not enough personnel to manage	Yes	<u>11</u>	No	<u>13</u>

- o Why are trips not more frequent?

o cost of outings too high	10
o not enough personnel to organize and manage outing	11
o demand not high enough	7
o appropriate vehicle not available	12
o other	1

Note: Many respondents indicated that persons are currently not accommodated on trips because they are either too disabled or there are not sufficient personnel to assist. Similarly, in response to the question on why trips are not more frequent, the second highest response was that not enough personnel are available to organize and manage outings. It is therefore apparent that not only is there a lack, for many respondents, of an appropriate vehicle, but also a lack of staff. If sufficient staff were available it is likely that the market for a suitable vehicle would be increased.

c) Funding of the 'Ideal' Vehicle:

- o If a vehicle of the kind we have in mind were manufactured, would your organization consider complete or partial purchase of one or more vehicles?

Yes	<u>13</u>
No	<u>15</u>
Don't Know	<u>4</u>

- o How many vehicles would you consider purchasing?

No. of vehicles	1	1-2	2	2-3
Respondents	7	3	4	1

Note: Total number of vehicles = 20-24

- o What is the maximum amount of funds you would be willing to commit towards the purchase of these vehicles?

Cost	\$10,000	\$25,000	\$35,000	\$60,000
Respondents	2	2	1	2

If the amount did not cover the entire cost would you consider a cost-sharing arrangement with one or more other organizations?

Yes	8
No	9
Possibly	1

- o If your organization did purchase one or more vehicles, on what basis would they operate?

o user pay all costs	3
o partially subsidized user pay	10
o cost entirely subsidized	10
o other	0

- o If you would not consider purchasing one or more vehicles, or if you found the cost of purchase too high even if shared, would you consider renting or leasing one or more vehicles?

Yes	16
No	7

- o How many vehicles would you rent or lease?

No. of vehicles	1	1-2	2	3-4
Respondents	9	3	1	1

d) Vehicle Concept: (drawings of a concept design were provided)

- o How well does the capacity meet your requirements?

o too small	2
o ideal capacity	23
o larger than necessary	6

- o Are the lift and ramp in the best location?

Yes	<u>22</u>
No	<u>12</u>

- o Is one lift and one ramp sufficient access for a vehicle of this size?

Yes	<u>24</u>
No	<u>8</u>

Note: Although the questionnaire did not ask which of the three concept designs was preferable, a number of respondents made comment, as follows:

Concept	A	B	C
Respondents	3	6	3

- o Approximately how many able-bodied staff would accompany a group of ten wheelchair users?

No.	1	2	3	4	5	4-10	5-10	6-10	7	8	10
Respondents	1	6	7	8	2	1	2	1	1	2	4

Note that 63% of respondents indicated that either 1, 2, 3 or 4 able bodied staff would accompany a group of ten wheelchair passengers.

- o What percentage of wheelchair users would likely prefer to transfer to a regular seat?

	<u>No. of Respondents</u>	<u>%</u>
. Less than 25%	27	73
. Between 25% and 50%	7	19
. Between 50% and 75%	3	8
. Over 75%	<u>0</u>	<u>0</u>
	37	100

- o What special features would be very useful or necessary on regular bus type seats?

	<u>No. of Respondents</u>	<u>%</u>
Removable Arm Rests	29	78
Seat Belts	35	93
Shoulder Belts	22	59
Adjustable Footrest	16	43
Fully Reclining Backrest	9	24

e) **Summary of Comments Provided with Respect to
Layout and Means of Access to the Concept Vehicle**

- o "There should be two lifts with the addition of seating for attendant. The seating should be so arranged so that attendants can attend."
- o "Lift should be more to the centre of the vehicle. More storage space required."
- o "For safety/stability each wheelchair user should be adjacent to side or back of vehicle and not in centre aisle. Access to overhead safety bars. Use rear ramp for emergency exit and lift for loading."
- o "Climatic conditions predicate one front door, dual purpose lift and steps."
- o "Seats should be provided when wheelchairs not used."
- o "Have ramp and lift at side of vehicle - ideally want two lifts."
- o "Centre aisle facing."
- o "Wheelchairs close to entrances. Walkers can reach remote areas of vehicle easier than placing chairs/walkers over wheel wells as shown."
- o "One or two wheelchair spots should allow sufficient room for recliner chairs. Optimally - ramp at the back for emergency purposes as well as the side lift for regular use. Move lift forward to centre of vehicle."
- o "Any lift should be forward of the rear seats because some wheelchairs can't fit between seats."
- o "Move the lift forward to centre of vehicle. Assuming vehicle is for long trips an accessible washroom is suggested. As well, baggage compartment, wheelchair clamps."
- o "Lift in current position requires a short right angle turn around stationary seats - would need to move seats - prefer rear loading lift."
- o "Move lift forward to centre of vehicle."
- o "Place all four seats on the right side of the bus, starting with lift to front alignment. Leave space directly behind passenger barrier for storage of carry-on items. Place a ramp door behind passenger side with a floor ramp - telescope for escape purposes in case of rear end collision."

- o "Preference would be to have one more lift and ramp in middle of bus; however the extra cost may not justify this convenience."
- o "Driver's seat should be accessible and hand controls available for a disabled driver."
- o "With the new rule in Ontario you are no longer allowed to side wheelchairs the way they are described in your design. They have to be attached to the side of the vehicle with metal pins going through the wheelchair wheels. If you have one lift I do not see the need for a ramp, thinking of all the disadvantages of a ramp (space, physical needs, etc.)."
- o "More seating for ambulatory passengers."
- o "Need good accessibility to wheelchairs."
- o "Access and exit at both ends of the vehicle. Front folding steps to ramp on lift."
- o "Ramp and lift should not be in same area in case of an accident."
- o "Front facing seats are essential. Raised doorways for high wheelchairs and walkers would be helpful. Grab bar on lift."
- o "Wheelchair emergency door on driver's side."

f) Summary of Vehicles Currently Being Used

The following table provides data, extracted from the questionnaires, on vehicles currently in use, and certain details and comments on the vehicles. It is apparent the vans are the most commonly used vehicle type. This is probably due both to the relatively low cost of vans and the unavailability of a suitable larger vehicle.

Table 2
Vehicle Summary

No.	Vehicle	Year	Modification	Capacity			Sufficient space?	Comfort	
				w/c	amb.	stretcher		Pax.	Driver
-	Fleury	1975-78		6-8	4	-	limited	good	good
-	Superior	1979-82		7-8	6	-	limited	fair	good
1	Ford Van	1979	w/c lift	5	11	-	yes	good	-
2	Superior Bus	1981	elect. lift	6	4	2	yes	good	good
3	Ford Bus	1976	elect. lift	4	6	2	yes	good	good
1	Dodge Van	-	high roof, lift	2	1	1	yes	fair	good

(Continued)

**Table 2
Vehicle Summary (cont'd)**

No.	Vehicle	Year	Modification	Capacity			Sufficient space?	Comfort	
				w/c	amb.	stretcher		Pax.	Driver
1	Dodge Van	-	removable seats	-	10	1	no	fair	fair
3	Dodge Cars	-		-	3-4	-	no	good	good
3	Busette	1980	w/c restraints hydraulic lift	5	4	-	no	good	good
7	Vans	-	lift	5	2	-	no	fair	fair
1	International Bus	1979	w/c and stretcher tiedowns	10	10	2	no	fair	fair
1	GMC Funcraft	1980	w/c tiedowns	4	5	-	yes	good	good
1	Dodge Maxivan	1982		12	-	-	yes	good	good
2	Dodge Vans	-	high roof, ramp, tiedowns and jump seats	5	8	2	-	good/ fair	-
11	Ford Vans	-	high roof, ramp, tiedowns and jump seats	5	8	2	-	good/ fair	-
1	GMC Bus	1979	w/c tiedown, lift, luggage racks	10	10-24	-	-	fair/ poor	-
2	Dodge Ram	1982	fibreglass top, lift	7	3	-	yes	good	good

g) Future Demand

The following table indicates the responses to the question (Q.5, Part II) pertaining to future demand ("If all future demand for group recreational/social transportation of the kind primarily described were to be met by your organization, how many trips would be made per year?"). It would appear that some respondents may have indicated trips other than social/recreational trips. It would appear, however, that most of those institutions that do have a vehicle or vehicles make frequent use of the vehicles for trips.

Table 3
Future Demand

Current No. of Trips	Annual Equivalent	1983-85		1986-90	
		Trips	(Pax)	Trips	(Pax)
6 per year	6	20	(30)	32	(50)
1 every 2 months	6	24	(10-15)	40	(15-20)
daily	220	75-80	(12-14)	75-80	(12-14)
daily	220	1000	(10)	1000	(10)
daily in summer	110	200	(4)	200	(4)
4-6 per month	48-72	225	(12)	500	(15)
1 per week	52	48	(-)	60	(-)
2 per year	2	6	(5)	10	(8)
2 per month	14	30	(20)	36	(40)
frequently	-	30	(35)	-	(-)
1 per week	52	50	(12)	75	(12)
-		10-16	(10-20)	10-16	(10-20)
2 per week	104	100-125	(7)	125-150	(8)
4 per week	208	250	(12)	350	(12)
variable		15	(10)	25	(15)
2 per week for 6 weeks	12	1000	(6)	1400	(6-8)
-		52	(10-15)	231	(10-15)
4 or 5 per year	4-5	6	(16)	-	(-)
6 per year	6	20	(60)	40	(60)
daily, 7 days per week	365	520	(5-13)	520	(5-13)
-		35	(25)	75	(25)
2-4 per week	104-208	260	(10)	364	(10)

The above table shows current number of trips and the anticipated number of annual trips for the two time periods 1983-85 and 1986-90 along with the number of passengers to be accommodated per trip.

It would appear that there is no consistent pattern discernable from the information provided other than that most operators anticipate an increase in trips. Some of these increases are modest, while others appear to be excessive. The Annual Equivalent figure is based on the answer to the question on the number of current trips made. Using this current annual equivalent as a base for comparison of future trips may not be valid in all cases due to the inaccuracy or ambiguity of the answers regarding the current number of trips.

If the anticipated increases, as stated, are reasonably accurate there will be a continued demand for a suitable vehicle.

2.2 Summary

- o Of the questionnaire respondents, 42% were hospitals or rehabilitation centres.
- o Of the 27 respondents who do use vehicles for group recreational/social trips the majority utilize one to three vehicles. Only two respondents indicated they use more than six vehicles.
- o The frequency of trips varies widely but the majority of respondents appear to use their vehicles on either a daily basis or between two and five times per week.
- o Most trips accommodate between five and ten persons.
- o Persons are not accommodated on trips for a variety of reasons, the most frequent being that they are too disabled.
- o The most common reason for trips not being more frequent is the unavailability of an appropriate vehicle. Cost and lack of personnel to assist are other major reasons.
- o Thirteen respondents indicated that they would consider either complete or partial purchase of one or more vehicles of the kind we described. The total number of vehicles under consideration for purchase is 20-24.
- o Only seven respondents gave an indication of the funding they would be willing to commit to the vehicle. Two suggested \$10,000, \$25,000 and \$60,000 while one suggested \$35,000.
- o Twenty of the twenty-three respondents indicated that the service would be either partially subsidized user pay or cost entirely subsidized.
- o Sixteen respondents indicated they would consider renting or leasing one or more vehicles. Nine of fourteen respondents would require only one vehicle.
- o The vehicle concept that was provided was considered to be 'ideal capacity' by twenty-three of twenty-eight respondents. The B configuration was the most popular.
- o Sixty-three percent of respondents indicated that they would require four or fewer attendants to accompany a group of ten wheelchair passengers.
- o Seventy-three percent of respondents indicated that from 0-25% of wheelchair passengers would likely prefer to transfer to a regular seat.

- o For regular bus type seats there was a strong demand for seat belts (95%), removable armrests (78%), and shoulder belts (59%).
- o With respect to vehicle access the most common suggestion was to place the lift further forward than indicated in the drawings provided.
- o Vehicles currently used are mostly modified vans.
- o There is an indication that there is an increase in demand for group recreational/social trips in the future.

It is suggested that the questionnaire returns indicate that there is a real need for a vehicle more suitable for recreational/social trips for groups of wheelchair passengers. It is apparent that, as is commonly the case with transportation for the handicapped, price is a major concern. There is an expressed demand for some twenty vehicles, however only three respondents are willing to commit in excess of \$30,000 to vehicle purchase.

3.0 VEHICLE REQUIREMENTS

3.1 Vehicle Size

It is apparent, from the questionnaire results, that a vehicle for transportation of groups of disabled persons is required, however it is also apparent that (a) there is no consensus between potential users as to the size and features of the vehicle, and (b) that there is little validity in providing a vehicle that is unreasonably expensive, despite meeting all the users other requirements.

The original objective of the project was essentially to determine what were the users requirements for a vehicle and thence examine manufacturing capabilities and costs. Following analysis of the data from the questionnaires and discussions with Transportation Development Centre it was determined that design and eventual construction of a new vehicle was not appropriate: no two users want the same vehicle and most users can ill afford a purpose built vehicle.

The majority of vehicles currently used by the potential user groups are modified vans. It was noted by a number of questionnaire respondents that a suitable vehicle for their purposes was not available. It appeared that an impasse had been reached: that available vehicles were not suitable and suitable vehicles were not affordable. This, however, may not be the situation.

It is suggested that a vehicle that is both affordable and functional, that is it meets the principal user requirements but dispenses with additional frills, is in fact available. The basic school bus is such a vehicle.

School buses are available in a wide range of sizes, and hence capacities; they utilize standard production components and have an exceptional record for reliability. School buses are, above all, reasonably priced and even with certain modifications to make them specifically suitable as a group transportation vehicle for handicapped persons they will be affordable to most potential user groups.

During the conduct of this study discussions have been held with a number of vehicle manufacturers in an attempt to identify currently available vehicles that, when modified, would meet the requirements of the user groups. No suitable vehicle was identified that was affordable, other than modified school buses.

At this time few modified school buses are used for transportation of groups of handicapped persons and the reason for this is unclear. These vehicles are not uncommon in service as commuter buses, airport buses and other services such as churches and community groups. It is postulated that perhaps user groups are unaware of the availability of this type of vehicle and are thus either making do with modified vans or, in other cases, not using a vehicle at all. It is thus considered appropriate to discuss modified school buses and, in this manner, attempt to indicate what vehicle configurations are potentially available.

Vehicles commonly referred to as school buses are manufactured in Canada by three major companies, Blue Bird, Thomas and Wayne. These companies are all body-builders, that is they purchase the chassis and engine from a manufacturer and add a body and its interior to produce a finished product. There are a limited number of chassis manufacturers and the three school bus manufacturers all purchase from the same suppliers. Basically each school bus manufacturer produces a range of vehicles and there are only minor differences between vehicles built on the same chassis.

1. Blue Bird have a series called Mini-Bird which utilize a chassis with a wheelbase of either 125, 133 or 157 inches. The larger wheelbase is commonly equipped with a body with overall length of 23 ft 7 ins. Note that the conventional manner of expressing body lengths in the bus manufacturing industry is as follows: 23 ft. 7 ins. = 2307. Such a manner is utilized in this report. The Mini-Bird series is considered too small for group transportation purposes having a capacity of only five wheelchairs.

The larger Blue Bird line is the Blue Bird Conventional, with body lengths ranging from 1305 to 3208, all with an interior width of 90 1/4 ins. The wheelbases range from 149 to 276 inches.

Blue Bird also produces a forward control vehicle, the All Canadian. This vehicle is produced in various body lengths from 2707 to 3903 and wheelbases of 149 to 246 inches.

2. Wayne produce a similar range of vehicles to Blue Bird, with the exception of the forward control. Their smaller vehicle (comparable to the Mini-Bird) is the Mighty Mite, utilizing a similar chassis.

Wayne vehicles corresponding to the Blue Bird Conventional are the Lifeguard line, which range from 1806 to 3403.

3. Thomas, the third major school bus manufacturer, again produce a similar range of buses utilizing the same chassis as Blue Bird and Wayne. The small vehicle is the Minotour. Thomas does not produce a forward control vehicle.

The various Blue Bird, Wayne and Thomas vehicles can be ranked by wheelchair capacity, on the basis of clear space both behind and in front of the wheelwells. In this regard the positioning of the body on the chassis is important. There may be differences in this regard between body manufacturers, however a general table of wheelchair capacity (forward facing) versus body length is as follows:

Table 4
Wheelchair Capacity

<u>Body Length</u>	<u>Wheelchair Capacity (max.)</u>
1800-2000	5
2000-2500	7
2500-2610	9
3004-3208	11
3403	15

The above figures are based on a wheelchair module of 44 by 27 inches and assuming two wheelchairs abreast and one centrally located between the wheelwells. The wheelchair capacity will be reduced by addition of normal seating. There are various body and wheelbase configurations that are more efficient than others. Specific vehicle sizes have been selected and are presented in Figure 1 and Figure 2 indicating possible interior configurations.

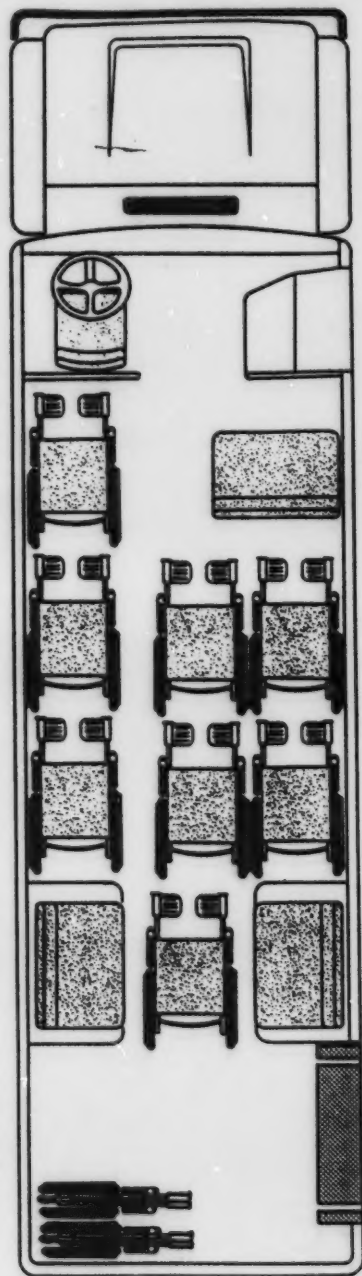
Figure 1 shows two concepts based on conventional school bus configurations. In these two examples wheelchairs are shown three abreast, thereby increasing vehicle capacity. It must be pointed out that this is not an optimum situation. Ideally there should be easy access by an attendant to any one of the wheelchairs in case of an emergency. Access is maintained to each wheelchair, in the design concepts, by means of a narrow aisle, however to administer attention to the furthest wheelchair from the aisle would necessitate impinging on the space of the neighbouring passenger. In the two examples, if the third row of wheelchairs were removed, the capacities would be reduced from 8 to 6, and from 13 to 9, in the configuration shown.

In Figure 2 the basic design vehicle is a forward control Blue Bird bus, in this case on a chassis of 201 ins. The two concepts indicate arrangements for 10 and 6 wheelchairs with 10 and 18 seated passengers respectively.

In both figures there is flexibility with regard to the mix of wheelchairs and seated passengers. It is recommended that if it is likely that any user will require flexibility then certain seats be removable and the space can be utilized for additional wheelchair capacity. For example in Figure 1, example a., if the front right seat were removed the new capacity would be 9 wheelchairs and 4 seated (as opposed to 8 and 6).

The reason the use of a school bus as the basic vehicle for the disabled group transportation vehicle is so suitable is that individual users can specify their particular requirements. A vehicle of appropriate size can be provided with no additional cost penalty because a wide range of body and chasis combinations are being utilized on an ongoing basis.

- (a) Concept based on Wayne Lifeguard; Body Model 2503; Wheelbase 236 ins.
Capacity: 8 wheelchairs, 6 seated



- (b) Concept based on Bluebird Conventional; Body Model 5208; Wheelbase 276 ins.
Capacity: 13 wheelchairs, 6 seated

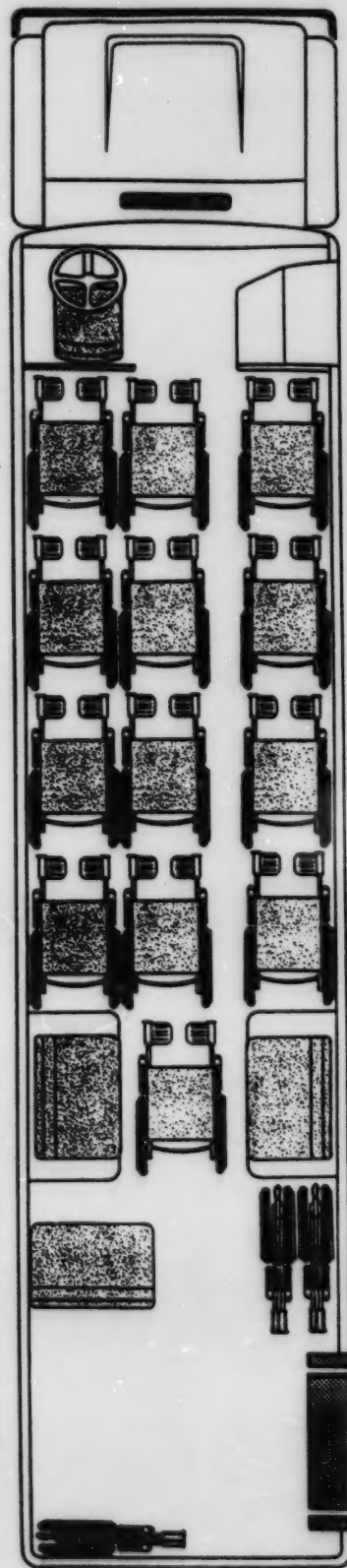
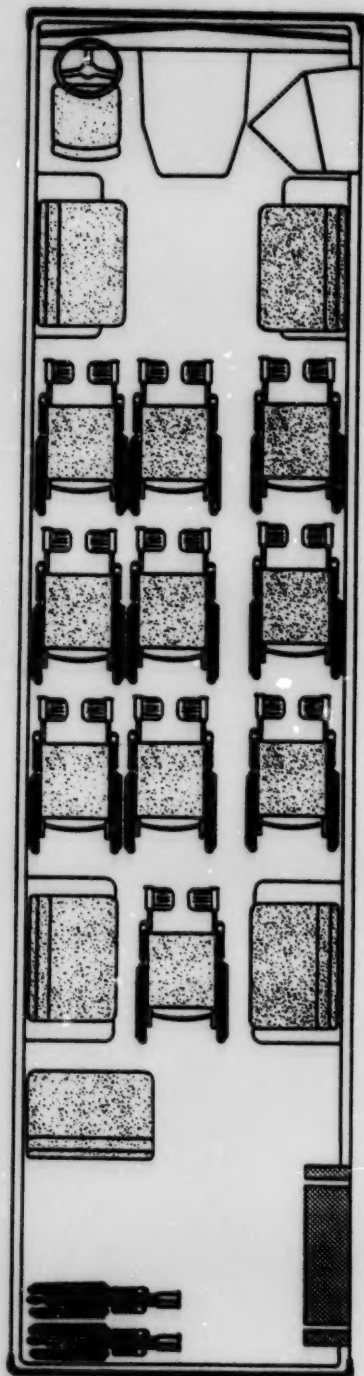


Figure 1
Vehicle Concepts, Conventional School Bus Configuration

(a) Capacity: 10 wheelchairs, 10 seated



(b) Capacity: 6 wheelchairs, 18 seated

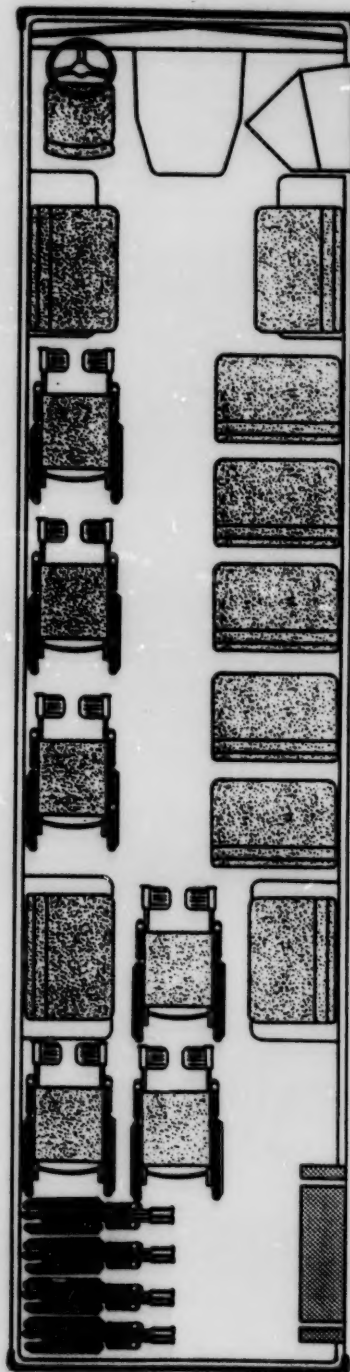


Figure 2
Vehicle Concepts, Forward Control Bus
Concept based on Bluebird All Canadian
on 201 wheelbase

3.2 Vehicle Modifications

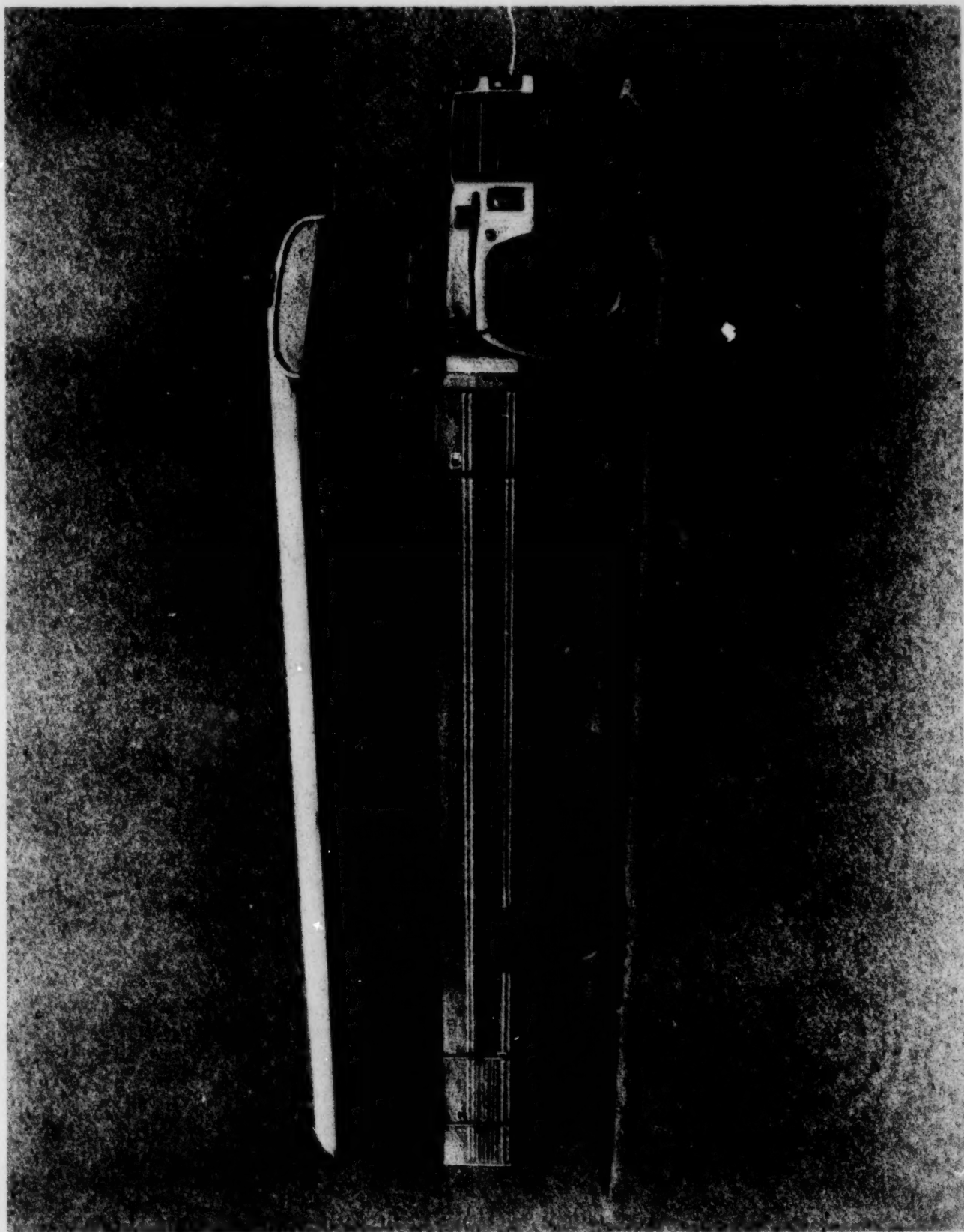
There is a certain hesitation often apparent when one recommends the use of a school bus to anyone for any purpose other than transportation of school children. School buses have, throughout the years, established a specific reputation. While the majority of aspects of this reputation are commendable (such as reliability, low cost, low maintenance, good parts availability, etc.), some are less attractive, such as the perceptions of not aesthetically pleasing, uncomfortable, too basic and so forth. Unfortunately people fail to recognize that the success of the school bus program in Canada is attributable in large part to these 'less attractive' aspects of the school bus, because it is by means of keeping the bus basic that the cost can be kept to a minimum. However it is not mandatory that the vehicle to be used for transportation of the handicapped should be unchanged from the basic school bus. Indeed it is suggested that the basic vehicle be used, thereby taking advantage of the commendable attributes, and that certain modifications be made to redress the less acceptable attributes. The cost of modifications will increase the total vehicle cost but not by an untenable amount. It is suggested that the following modifications be considered:

- body colour; any deviation from the conventional ochre yellow will give the vehicle a different appearance from the standard school bus. Colours (and the paintwork design) should be chosen to best disguise the block-like appearance of the vehicle;
- windows; both school bus type (opening at the top) and transit type (sliding) windows are usually available. The latter type tend to improve the appearance of the vehicle due to the vertical lines rather than another horizontal line created by the window edge. Specific consideration should be given to use of tinted windows, offering greater privacy and, when used in conjunction with an air-conditioner, a more stable interior temperature in summer;
- air conditioning; the addition of an air conditioning unit may be justified, especially if the vehicle is intended for frequent summertime use. Improved insulation should be incorporated into the body structure if possible, providing both winter and summer benefits;
- vehicle access; it is suggested that use of a modified school bus should incorporate the wheelchair lift behind the rear axle. With the lift in this location best use is made of the interior space. The rear overhang area is the least comfortable area in which to ride due to its exaggerated vertical movement and thus, where possible, wheelchair passengers should be located in that area between the axles. A rear door is required and a ramp should be utilized with this door. Although motorized stretchers can be loaded into the vehicle by means of the wheelchair lift and manual support, a ramp access is preferable. The forward located passenger access door can be either forward folding (opening inside the bus), in-out (rear leaf opens in and front, out) or out-out (both leaves opening outward). Emergency escape windows must be installed. Although it is recognized that in

the event of an accident it is unlikely that wheelchair passengers could use these exits, their safety may be ensured with assistance from others utilizing these windows.

- . wheelchair securement; a number of acceptable options are available. The most important aspect (following safety) is ease of utilization and compatibility with different types of wheelchairs in different locations. A system utilizing a flush mounted floor track is recommended. Attention must be given to restraint of both the wheelchair and the occupant, rather than simply the wheelchair.
- . seats; the design mix of wheelchair and ambulatory passengers will determine the vehicle's seating requirements. In all cases the area over the wheelwells can be used for sideways facing seats and other seats can be installed as required. Seating for attendants in the rear of the vehicle is advisable: the attendants have a good view of the passengers and also this area is, as previously mentioned, somewhat less comfortable than positions further forward.
- . vehicle suspension; one of the principal concerns expressed about school buses is their rough ride and heavy suspension. This perceived problem can be solved by the installation of air ride suspension or modified suspensions using rubber springs. All of the chassis used for school buses can accept modified suspensions.

The following figure, Figure 3, indicates the possible appearance of a modified school bus for use in transportation of the handicapped. The figure shows that the vehicle, while based on a conventional school bus, need not look like a school bus when appropriately modified.



4.0 COST AND FUNDING

4.1 Vehicle Cost

The overriding problem in provision of an acceptable vehicle for transportation of the handicapped is that the user's perceived requirements and funds available are frequently totally incompatible. For this reason a reasonable compromise must be sought. Indeed every nursing home or rehabilitation centre would probably like a first class vehicle for their recreational trips, however the provision of transportation is of secondary concern compared to their health care function, and funds are often not available.

There are basically three options open to the purchaser of a vehicle for transportation of reasonably large numbers of handicapped persons, as per the object of this study. These options are to purchase (a) a medium sized transit type vehicle or (b) a school bus, or alternatively to have a custom made body added to a standard chassis. During the course of this study all three options were examined before recommending the school bus option. The transit vehicle approach is inappropriate due to the limited number of appropriate medium sized vehicles and their cost. For the application in question, few if any user groups could justify the expense associated with this type of vehicle. Similarly, with a custom build body, whether fibreglass or any other material, cost is invariably high. Discussions have been held with a number of fabricators. There appear to be no advantages in taking this route. The third option, that of the modified school bus, offers the least cost per vehicle while, at the same time, meeting the general transportation requirements of the user with a reliable vehicle.

The size of a basic school bus has relatively little effect on the cost: there is not a wide variation in cost between a body length of 2000 and 3200. For the conventional school bus configurations the estimated cost of the vehicles ranges between about \$35,000 to about \$52,000 depending on options. For the purposes of estimating, air suspension adds about \$3,500 and the lift a further \$4,000 to \$6,000 to vehicle cost. These are the principal additional costs to be incurred. The forward control vehicle is significantly more expensive, generally being in the \$90,000 area, and, for the intended purpose, there appear to be insufficient advantages to warrant selection of this vehicle.

4.2 Funding

Considerable attention has been paid to the identification of potential funding sources available to an institution for purchase and/or operational cost of a vehicle. No specific funding sources have been identified. There are no federal agencies providing funds for such a purpose and no provincial sources have been found that are applicable to an institutionally owned and operated vehicle. It appears that there are two potential sources of funding that have been used in the past with success and these are service agencies and selected corporations. It must be emphasized that these two sources do not have a formal funding program, however may be amenable to provision of certain funds if approached on a specific project. Service agencies have an

excellent reputation for assisting the elderly and handicapped, but it is up to each individual branch or local to determine their priorities and to select the projects that they wish to support. Similarly some corporations have supported such causes in the past, but must also be approached on an individual basis. In summary, it is up to each institution to approach whomever they think might be able to assist with financing as there are no specific funds for vehicle purchase available from any federal or provincial departments.

5.0 CONCLUSIONS

Many institutions have indicated that a suitable vehicle for group social/recreational trips is currently not available. The vehicles most commonly used are modified vans, however their capacity is limited. From the institutions sampled there was an expressed interest in 20-24 special vehicles but few institutions are willing (or capable) of paying the full price for such a vehicle. Having determined the general requirements expressed by the sample of user groups, including their financial ability to pay for such a vehicle, it was determined that the most appropriate vehicle for group transportation for the disabled is a modified school bus. Other alternatives are generally significantly more expensive and offer few, if any, additional benefits. The demand for the modified school bus is likely to approach the figure expressed in the questionnaire (20-24) whereas a more expensive vehicle would have a lower demand. It is suggested that institutions requiring a vehicle for social and recreational trips would not have a demand greater than 50 vehicles over a five year period. The provision of this type of service is generally ancillary to the principal functions of the institutions and, if expenses are too great, cannot easily be justified. It is apparent that the potential total demand is insufficient for the production of a specialized vehicle and that the modified school bus is the only viable alternative, being flexible in size and reasonably priced.

The two biggest advantages inherent in the selection of a school bus are the proven design and technology, and the extensive range of sizes that the basic vehicle is available in. The proven design and large volume construction lead to increased reliability and reduced cost. The range of available sizes is important in that no specific size of vehicle is considered optimum by the potential user groups and thus various sizes must be available. An indication of the range of sizes, suitable for the group transportation vehicle, is given in Appendix C. For the conventional school bus, specific chassis and body model configurations are given for some Wayne and Blue Bird Vehicles. It should be noted that Thomas can provide a similar range of vehicles. Addresses of the manufacturers are provided in Appendix D.

It is suggested that, if possible, a modified school bus be made available to a selected user group on a trial basis. Each of the vehicle manufacturers has provided specially modified vehicles, but principally to contract service providers rather than to institutions. If a specially specified vehicle could be made available to a selected institution it could be used as a display vehicle to indicate what is available from this source. Certain recommendations have been made in this report on the specific vehicle modifications, however, within these guidelines the choice of specific items will be made by the user of the vehicle, probably on the basis of past experience.

In conclusion, it is considered inappropriate to prepare a concept design for a special vehicle for transportation of groups of disabled persons. The vehicle would be insufficiently flexible in size to satisfy user group demand which, in any case, is low volume. Such a vehicle would also be too expensive for most institutions. A realistic compromise must be reached between cost and vehicle design and performance. It is considered that the most appropriate vehicle type is a modified school bus. Reliability, parts availability, a wide range of sizes and reasonable cost are specific advantages that this vehicle offers.

APPENDIX A
Copy of Questionnaire

STUDY ON

DISABLED GROUP TRANSPORTATION VEHICLE

The consulting engineering firm of DeLCan (De Leuw Cather Canada Ltd.) is currently undertaking a project for the Transportation Development Centre, Transport Canada on the design and development of a Group Transportation Vehicle for Disabled Persons.

Acceptable means of transportation of the disabled for short, specific intra-urban trips (eg. doctor appointments, hospital visits, trips to and from work, etc.) is generally available. However, there are strong indications that a suitable and affordable vehicle is often not available for taking groups of handicapped persons on longer, social and recreational trips. The types of trips that we envisage for this vehicle are, say, those for sightseeing, or visits to shrines, parks, picnics, zoos, sports events (perhaps for a handicapped sports team), and various types of long-distance outings.

The design of a vehicle for these purposes would need to meet the specialized requirements for carrying what may be relatively large groups of disabled persons, some of whom may be on stretchers and/or need special sustaining equipment.

A principal component of this project is to attempt to determine the extent of the demand across the country for a vehicle of this kind. We also wish to establish the most acceptable performance requirements for such a vehicle, and to identify potential sources of funding.

An essential input to the successful undertaking of the project is the co-operation of possible user groups in providing data which will serve as the basis of our estimates. For this reason, you are asked to please assist by completing this questionnaire.

We do appreciate that some of the information we are requesting may be difficult to provide, and that some may even be considered quasi-confidential. However, without your best efforts at providing this information, the undertaking of this very worthwhile project will be extremely difficult. Please take the time to complete the questionnaire and return it, as soon as possible, to:

DeLCan (Attention: P. Kaulback)
P.O. Box 8004
Ottawa, Ontario
K1G 3H6

Thank you so much for your co-operation.

APPENDIX B
Copy of Follow-up Letter

DeLCan

DE LEUW CATHER, CANADA LTD.

CONSULTING ENGINEERS AND PLANNERS INGENIEURS CONSEILS ET PLANIFICATEURS

1983 06 21

Our Ref: 04-1290A-00

Dear Sir/Madam:

Re: Disabled Group Transportation Vehicle

You may remember that approximately six weeks ago you received a questionnaire on the subject of travel patterns, transportation needs and your requirement for a specially designed disabled group transportation vehicle. To this date we have not received a response and thus would earnestly request that you let us have your comments as soon as possible. If the questionnaire is pertinent to your operation please complete it, and if it isn't then a note to that effect would be much appreciated in order that our assessment of potential demand for the vehicle can proceed.

Thank you very much for your anticipated response.

Yours very truly,

P.J. Kaulback
Project Manager

PJK:ch

DISABLED GROUP TRANSPORTATION VEHICLE

USER-GROUP QUESTIONNAIRE

This questionnaire is addressed to any group or organization that may benefit from the availability of a vehicle capable of carrying groups of handicapped persons on inter-city trips or trips other than urban trips, for the purposes already described. The questionnaire is presented in six sections as follows:

- I BACKGROUND INFORMATION
- II USER GROUP TRAVEL PATTERNS AND DEMAND
- III VEHICLES YOU USE FOR RECREATIONAL/SOCIAL GROUP TRANSPORTATION
- IV SPECIFICATION OF THE 'IDEAL' VEHICLE FOR RECREATIONAL/SOCIAL GROUP TRANSPORTATION
- V FUNDING OF THE 'IDEAL' VEHICLE
- VI VEHICLE CONCEPT

I BACKGROUND INFORMATION

1. Organization Name _____
Address _____

2. Name of Respondent _____
Title or Position in the Organization _____
Address (if different from above) _____
_____ Tel. _____ - _____

3. Type of Organization (check one)

Hospital or Rehabilitation Centre _____

Group Home (eg. Nursing Home) _____

Medical Society or Group _____

Service Club _____

Charitable Organization _____

Travel Agency _____

Sports Team or Organization _____

Other (please specify) _____

4. Names of communities and/or regions served by your organization.

II USER GROUP TRAVEL PATTERNS AND DEMAND

In the section below, many items call for statistics which you may find very difficult to give. Please give your best estimate, even if it is only a guess. However, we would ask that you mark each estimate with S, E, or G, in the appropriate column, indicating as follows:

S = estimate based on statistical records
E = estimate is an educated guess
G = estimate is only a guess

	<u>Estimate</u>	<u>S?</u> <u>E?</u> <u>G?</u>
1. Total population in the regions your organization serves	_____	_____
2. <u>Handicapped Population in These Regions</u>		
(a) Total number	_____	_____
(b) Number making up <u>your</u> clientele	_____	_____
(c) Number, in addition, who make up clientele of <u>other</u> organizations serving the same regions	_____	_____
(d) Names of the other organizations and contacts and telephone numbers if available	_____ _____ _____ _____	
(e) Remainder of handicapped in these regions who are not served by <u>any</u> organization	_____	_____
Note: the numbers at (b), (c), and (e) should add up to that at (a)		
(f) If there <u>is</u> a <u>remainder</u> not being served at all, (that is to say, the number in (e)), could you explain why (eg. geographically remote, too disabled, etc.)	_____ _____ _____ _____	

3. Use of Vehicle(s) by Your Organization

Estimate

S?
E?
G?

- (a) Does your organization use one or more vehicles to provide group recreational/social trips of the kind described in the introduction to this questionnaire?

Yes ____ No ____

If Yes, continue. If No, go to Question 4.

- (b) No. of vehicles your organization uses _____

- (c) How often are trips made? _____

- (d) What is the average number of persons per trip? _____

- (e) What kinds of trips are made (eg. picnics, camping, sports, etc.)?

- (f) How many of your clientele have been on at least 1 trip in the last two years? _____

- (g) Do you sometimes include clientele of other organizations on these trips? _____

Yes ____ No ____

- (h) If Yes, how many of these additional individuals have been on at least 1 trip in the last two years? _____

- (i) On the average, is the capacity of the vehicle(s) you use sufficient to accommodate the demands on it for recreational/social trips?

Yes ____ No ____

- (j) If No, by about how many persons per trip? _____

3. Use of Vehicle(s) by Your Organization (cont'd)

Estimate

S?
E?
G?

- (k) Are there persons not accommodated on recreational/social trips for any of the following reasons:

persons beyond radius of pickup region Yes ____ No ____

persons too disabled to be accommodated with existing equipment Yes ____ No ____

not enough personnel to manage all who would like to go Yes ____ No ____

other (please specify)

- (l) Among those who have been on 1 or more trips in the past two years, how many have expressed a desire for more frequent outings? _____

- (m) Why are trips not more frequent? Check 1 or more.

cost of outings too high _____

not enough personnel to organize and manage outings _____

demand not high enough _____

appropriate vehicle not available _____

other (please specify)

4. Use of Vehicles by Other Organizations

- (a) Do any other organizations use 1 or more vehicles to provide group recreational/social transportation of the kind described in the introduction of the questionnaire for the disabled in your regions?

Yes ____ No ____ Don't know ____

If Yes, please identify the organization, contact and telephone number if available.

5. Summary of Future Demand

(1983-1985)

(1986-1990)

Please give your best estimates to the items below for each of the two indicated time periods.

- (a) If all future demand for group recreational/social transportation of the kind previously described were to be met by your organization, how many trips would be made per year?

- (b) On the average, how many passengers would be accommodated per trip?

- (c) What types of trips would be made? (Order from most to least frequent)

- (d) If vehicles were available, which were designed and built according to specifications which take account of both the specialized kind of populations transported and the nature of recreational/social trips, by what per cent do you think future demands would increase?

- (e) If Nil or Zero, would you please explain

6. Would you please use the space below to make any comments which may help increase our understanding of the nature of demand and use of vehicles for recreational/social trips in your region.

For those without vehicles, please go to Section IV.

III VEHICLES YOU USE FOR RECREATIONAL/SOCIAL GROUP TRANSPORTATION

Complete for each vehicle type you use.

	Vehicle Type 1	Vehicle Type 2	Vehicle Type 3
Number of vehicles			
Make			
Model			
Year			
Modifications: Describe, if any			
Capacity:			
No. wheelchair passengers			
No. ambulatory passengers			
No. stretcher passengers			
No. other - specify _____ passengers			
Equipment Carried:			
Respirators			
Oxygen			
First Aid Kit			
Is their sufficient space for: Walkers, crutches, overnight baggage, sports equipment, etc?			
Interior seating: (diagram)			
Accessibility:			
Location of doors			
No. & type of ramps			
No. & type of lifts			
Other details - specify			
Safety features:			
No. & type restraint systems			
Other - specify			
Comfort - poor/fair/good?			
Passenger			
Driver			
Ownership & Use			
Owned by - name org'n(s)			
Use Basis: Own, part ownership, loan (Check One)			
Other details - please add any information you feel would add to our understanding of the subject matter			

Note: If your organization uses more than 3 vehicle types, please utilize additional copies of this page.

IV SPECIFICATIONS FOR THE 'IDEAL' VEHICLE(S) FOR RECREATIONAL/SOCIAL GROUP TRANSPORTATION

Capacity	
Number of wheelchair passengers	
Number ambulatory passengers	
Number stretcher passengers	
Number other - specify _____ passengers	
Accommodation for	
Respirators	
Oxygen	
First Aid kit	
Walkers, Crutches, etc.	
Overnight baggage	
Sports equipment	
Musical equipment	
Other - specify _____	
Washroom Facilities	
Describe needs	
Other details - please mention any other features you feel this vehicle would need to have to be suitable for group recreational/social trips for the disabled in your regions - your comments are valued	
Number of vehicles required	
Frequency of use per vehicle	
Types of trips that would be made in order of most to least frequent	

V FUNDING OF THE 'IDEAL' VEHICLE(S)

1(a) If an ideal vehicle of the kind we have in mind were manufactured, would your organization consider complete or partial purchase of one or more vehicles?

Yes _____ No _____

(b) How many vehicles would you consider purchasing?

(c) What is the maximum amount of funds you would be willing to commit toward the purchase of these vehicles?

\$ _____

(d) If this amount did not cover the entire cost, would you consider a cost-sharing arrangement with one or more other organizations?

Yes _____ No _____

(e) If Yes, how certain are you that such an arrangement would be feasible?

Very
Uncertain

Somewhat
Uncertain

Very
Certain

(f) If possible, please name the organization(s) which might be willing to share in such an arrangement with you

(g) If your organization did purchase one or more vehicles, on what basis would they operate?

user-pay all costs _____

partially subsidized user pay _____

cost entirely subsidized _____

other (specify) _____

2(a) If you would not consider purchasing 1 or more vehicles, or, if you found the cost of purchase too high even when shared, would you consider renting or leasing 1 or more vehicles?

Yes _____ No _____

(b) If Yes, how many vehicles would you rent or lease?

(c) If possible, would you name other potential funding sources for outright or cost-sharing purchase of 1 or more vehicles

VI VEHICLE CONCEPT

The accompanying drawing shows a possible group transportation vehicle. The interior arrangement can be varied by means of removable seats and wheelchair tie-downs. The carrying capacity shown for three arrangements is as follows:

- A - 12 wheelchairs and 4 seated
- B - 7 wheelchairs and 10 seated
- C - 4 wheelchairs and 8 seated and 2 stretchers

We would like your comments on these concepts, particularly on the following questions:

1. How well does the capacity meet your requirements?
 - too small
 - ideal capacity
 - larger than necessary
2. Are the lift and the ramp in the best location?
 - YES
 - NO. Please explain and mark locations you would prefer on the drawing.
3. Are there any other interior arrangements that would be more useful? If so, please briefly describe.

4. Is one lift and one ramp sufficient access to a vehicle of this size? If no, please describe your preference.

5. Approximately how many able-bodied staff would accompany a group of ten wheelchair users (not including driver)?

6. What percentage of wheelchair users would likely prefer to transfer to a regular seat?

Less than 25%

Between 25% and 50%

Between 50% and 75%

Over 75%

7. What special features would be very useful or necessary on regular bus-type seats?

Removable armrests

Seat belts

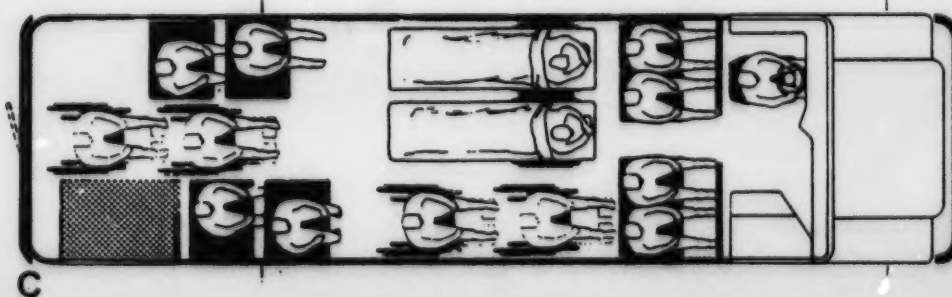
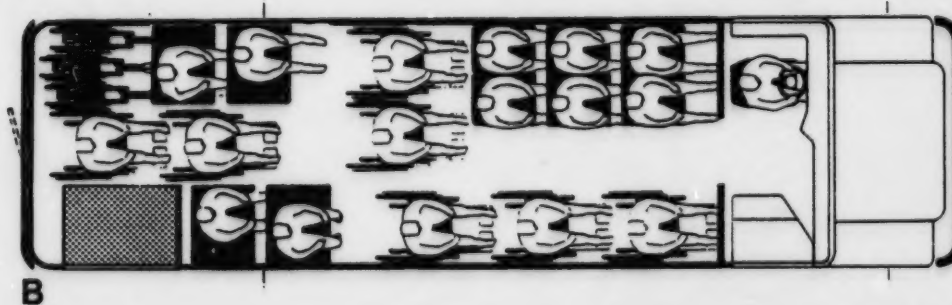
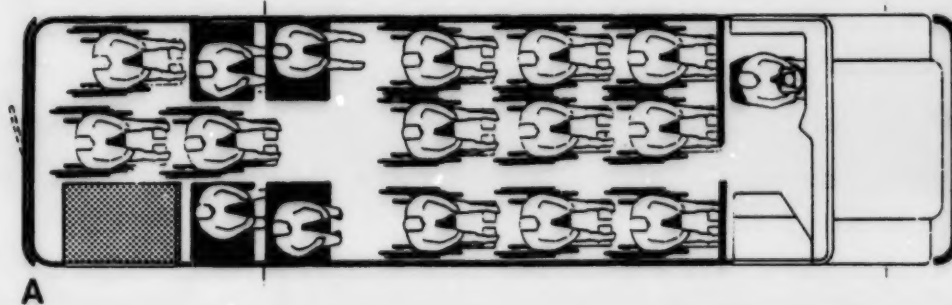
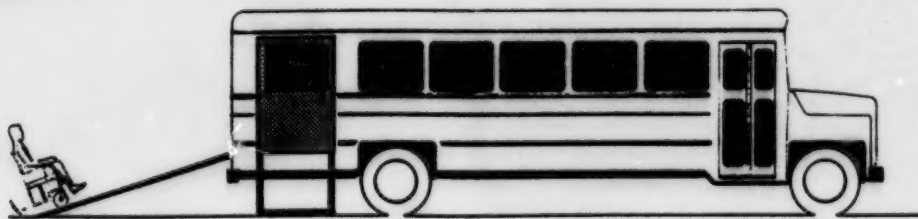
Shoulder belts

Adjustable footrest

Fully reclining backrest

8. Briefly describe the type of wheelchair tie-down you would prefer to use in a vehicle of this type.

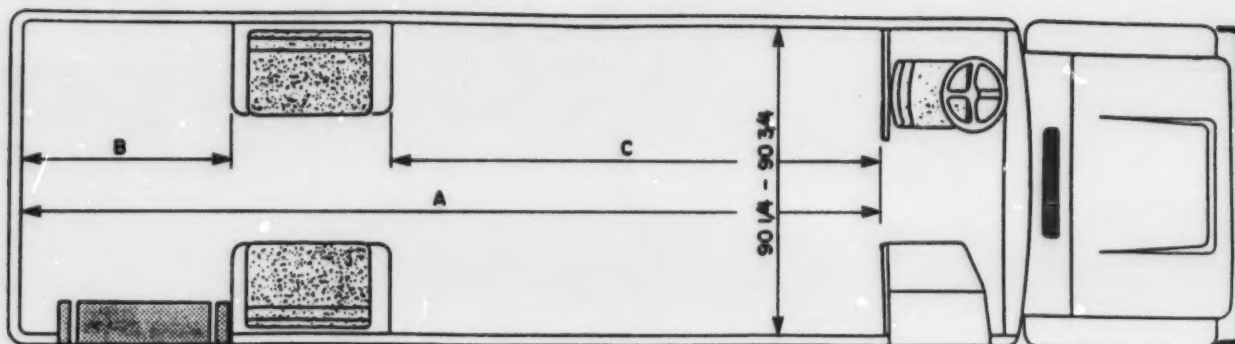
Please feel free to add any comments you may have about the vehicle.



APPENDIX C

Examples of Dimensions of Available Vehicles

- (a) Conventional School Bus**
- (b) Forward Control Bus**



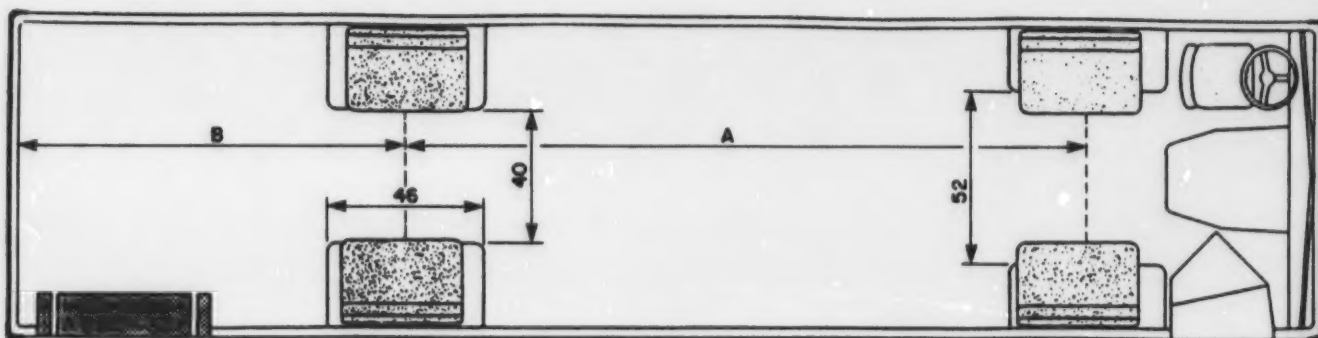
WAYNE

<u>Body Model</u>	<u>Wheelbase</u>	<u>A</u>	<u>B</u>	<u>C</u>
1806	170	172	66	60
2000	193	199	52	101
2009	193	217	70	101
2203	193	226	53	127
2300	218	226	78	102
2406	218	244	71	127
2503	218	253	80	127
2503	236	253	63	144
2609	236	271	81	144
2706	236	280	90	144
2900	254	298	90	162
2909	254	307	99	162
3103	276	325	96	183
3200	276	334	105	183
3403	276	361	132	183

BLUE BIRD

<u>Body Model</u>	<u>Wheelbase</u>	<u>A</u>	<u>B</u>	<u>C</u>
1808	149	178	71	59
2005	170	199	72	79
2304	189	234	87	99
2610	218	276	100	128
2807	235	297	104	145
3004	254	318	106	164
3208	276	346	113	185

(a) Table of Dimensions of a Selection of Available Body and Wheelbase Combinations, Conventional School Bus.



<u>Wheelbase (A)</u>	<u>Body Model</u>	<u>Rear Overhang (B)</u>
149 ins.	2707	108 ins.
179	3101	120
194	3108	112
201	3210	119
209	3400	125
216	3502	135
224	3611	145
231	3706	145
239	3706	137
246	3903	151

(b) Table of Dimensions of a Selection of Available Body and Wheelbase Combinations, Forward Control Bus, (Blue Bird, All Canadian).

APPENDIX D

Addresses of Major School Bus Manufacturers

BLUE BIRD

Canadian Blue Bird Sales Co.
Airport Road
Brantford, Ontario

(519) 759-4960

Attn.: Mr. F. Beemer, Sales Manager

WAYNE

Welles Corporation Ltd.
2650 Metcalfe Street
Windsor, Ontario
N8Y 4R5

(519) 945-6311

Attn.: Mr. M. Dinchik

THOMAS

Thomas Built Buses of Canada Limited
P.O. Box 580
Woodstock, Ontario

(519) 539-1225

Attn.: Mr. K. Takata, Sales Manager



The three manufacturers will indicate to any prospective purchaser the appropriate dealership to be contacted.